Listing of Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

16. (previously presented) An electric fluid dispenser for dispensing a fluid onto a substrate comprising:

a dispensing valve movable between open and closed positions for controlling a flow of the fluid from said fluid dispenser;

a solenoid coil operable to cause said dispensing valve to move between the open and closed positions;

a power circuit comprising

a power switching circuit providing a stepped current waveform to said solenoid coil, and

an unregulated power supply providing an output voltage to said power switching circuit; and

a control circuit comprising

a power switch control operable to cause said power switching circuit to provide said stepped waveform comprising an initial peak current followed by a lesser hold current, said initial peak current having a rate of current flow represented by a slope of a leading edge of said initial peak current, said slope of the leading edge being produced in response to a first output voltage from the unregulated power supply,

a current sensor providing a current feedback signal representing current flow in said solenoid coil, and

a duty cycle control responsive to said output voltage from said unregulated power supply and said current feedback signal and being operable to cause said power switch control to maintain the slope of the leading edge of said initial peak current substantially constant in response to changes in said output voltage from said first output voltage.

17. (previously presented) The electric fluid dispenser of claim 16 wherein said duty cycle control is operable to cause said power switch control to modulate the leading edge of said initial peak current with a duty cycle determined as an inverse function of the output voltage from the unregulated power supply, thereby maintaining a time required to move said valve to an open position substantially constant.

18. (previously presented) The electric fluid dispenser of claim 16 wherein said hold current provides a rate of current flow represented by a slope of a trailing edge of said hold current, the slope of the trailing edge being produced in response to said first output voltage from the unregulated power supply, said duty cycle control is operable to cause said power switch control to modulate the trailing edge of said hold current with a duty cycle determined as an inverse function of the output voltage from the unregulated power supply, thereby maintaining a time required to move said valve to a closed position substantially constant.

19. (previously presented) The electric fluid dispenser of claim 16 wherein said power switch control comprises a pulse width modulator.

20. (currently amended) The electric fluid dispenser of claim 16 wherein said power switch control comprises:

a waveform generator producing a stepped waveform representative of said initial peak current followed by said lesser hold current;

a summing node responsive to said stepped waveform from said waveform generator and said current feedback signal;

a hysteresis modulator connected to an output of said summing node; and

said duty cycle control comprises

a pulse width modulator;

a duty cycle controller connected to said pulse width modulator and said unregulated power supply, said duty cycle controller changing a duty cycle of said pulse width modulator in response to changes in said output voltage from said unregulated power supply; and

a first logic circuit having inputs connected to an output of said hysteresis modulator and an output of said pulse width modulator and causing the leading edge of said initial peak current to be modulated with a duty cycle determined as an inverse function of the output voltage from the unregulated power supply.

21. (previously presented) The electric fluid dispenser of claim 20 further comprising a second logic circuit having an input connected to said output of said pulse width modulator and causing the trailing edge of said hold current to be modulated with a duty cycle determined as an inverse function of the output voltage from the unregulated power supply.

22. (previously presented) The electric fluid dispenser of claim 20 wherein the pulse width modulator is a fixed frequency pulse width modulator.

23. (previously presented) The electric fluid dispenser of claim 21 further comprising a system control providing a trigger signal to said waveform generator for initiating a generation of said stepped waveform.

24. (previously presented) A method of operating an electric fluid dispenser for dispensing a fluid onto a substrate, the fluid dispenser having a dispensing valve operatively connected to a solenoid coil, the solenoid coil being operative to move the dispensing valve between open and closed positions for controlling a flow of the fluid from the electric fluid dispenser, the method comprising:

providing an unregulated power supply supplying an output voltage to a power switching circuit connected to the solenoid coil;

producing with the power switching circuit a stepped current waveform having an initial peak current followed by a hold current, the initial peak current providing a rate of current flow represented by a slope of a leading edge of the initial peak current, the slope of the leading edge being produced in response to a first output voltage from the unregulated power supply;

maintaining the slope of the leading edge of the initial peak current substantially constant in response to the output voltage from the unregulated power supply deviating from the first output voltage; and

applying the stepped current waveform to the solenoid coil to operate the solenoid coil and the dispensing valve with an operational speed substantially independent of changes in the output voltage from the unregulated power supply.

25. (previously presented) The method of claim 24 further comprising:

modulating the leading edge of the initial peak current with a duty cycle determined as an inverse function of the output voltage from the unregulated power source to maintain the slope of the leading edge of the initial peak current substantially constant; and

applying the initial peak current to the solenoid coil to maintain the actuation time to open the dispensing valve substantially constant and independent of changes in the output voltage from the unregulated power supply.

26. (previously presented) The method of claim 25 wherein the hold current provides a rate of current flow represented by a slope of a trailing edge of the hold current, the slope of the trailing edge being produced in response to the first output voltage from the unregulated power supply, the method further comprising:

maintaining the slope of the trailing edge of the hold current substantially constant in response to the output voltage from the unregulated power supply deviating from the first output voltage; and

applying the hold current to the solenoid coil to operate the solenoid coil and the dispensing valve with an actuation time to close the dispensing valve substantially independent of changes in the output voltage from the unregulated power supply.

27. (previously presented) The method of claim 26 further comprising modulating the trailing edge of the hold current with a duty cycle determined as an inverse function of the output voltage from the unregulated power supply.